FIG. 1

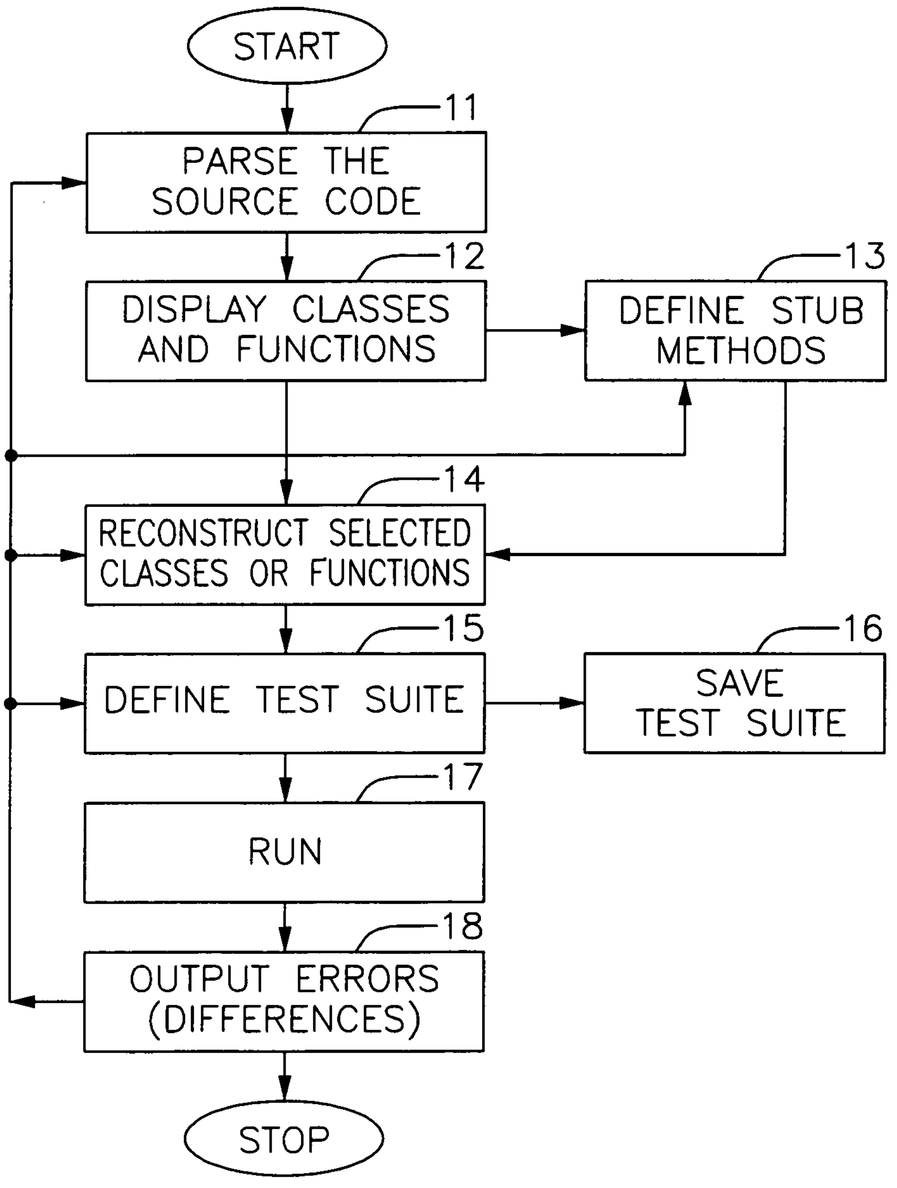

START
11
PARSE THE SOURCE CODE
12
DISPLAY CLASSES AND FUNCTIONS
13
DEFINE STUB METHODS
14
RECONSTRUCT SELECTED CLASSES OR FUNCTIONS
15
DEFINE TEST SUITE
16
SAVE TEST SUITE
17
RUN
18
OUTPUT ERRORS (DIFFERENCES)
STOP

FIG.2

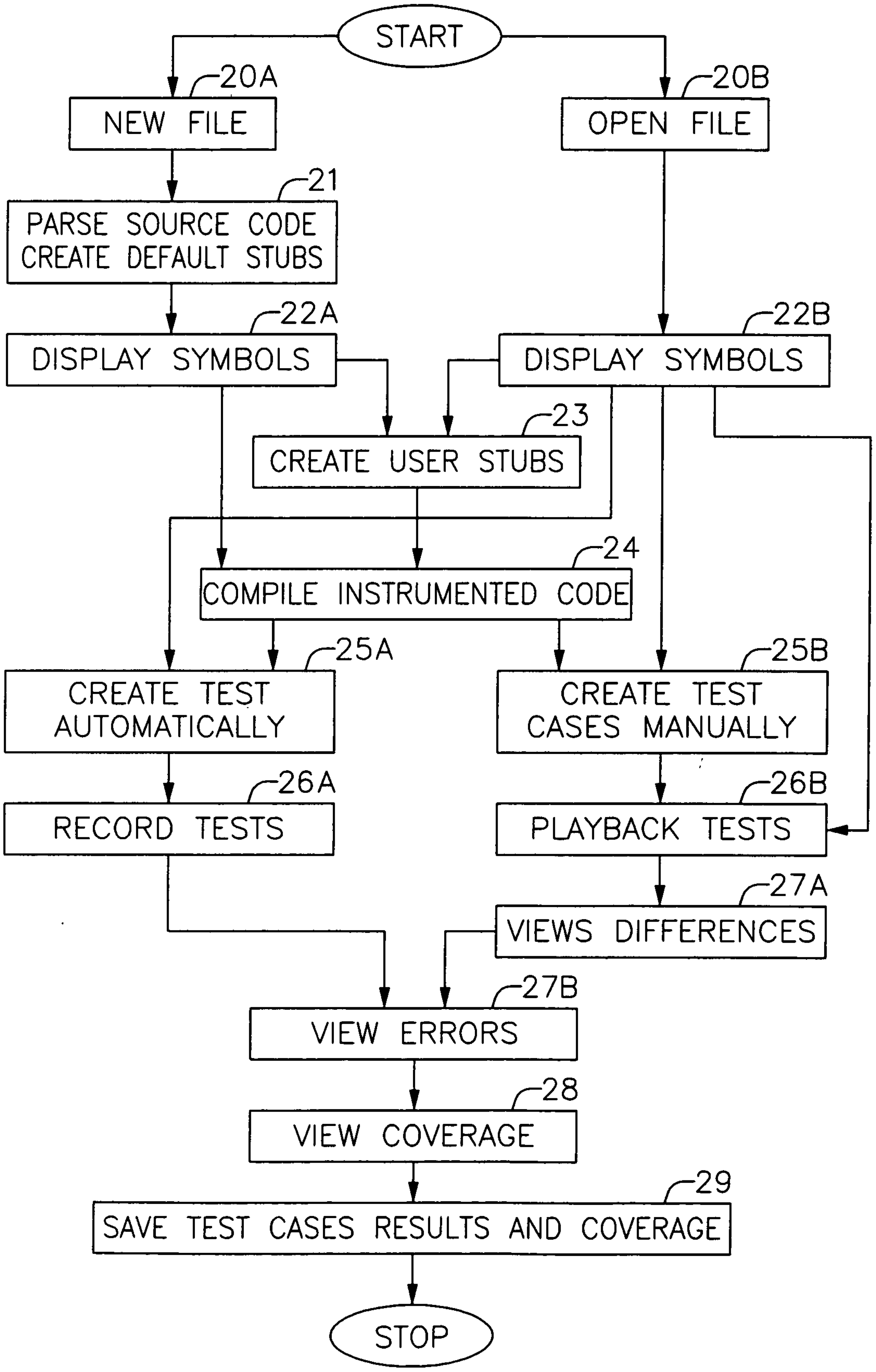

START
20A
NEW FILE
20B
OPEN FILE
21
PARSE SOURCE CODE CREATE DEFAULT STUBS
22A
DISPLAY SYMBOLS
22B
DISPLAY SYMBOLS
23
CREATE USER STUBS
24
COMPILE INSTRUMENTED CODE
25A
CREATE TEST AUTOMATICALLY
25B
CREATE TEST CASES MANUALLY
26A
RECORD TESTS
26B
PLAYBACK TESTS
27A
VIEWS DIFFERENCES
27B
VIEW ERRORS
28
VIEW COVERAGE
29
SAVE TEST CASES RESULTS AND COVERAGE
STOP

FIG. 3

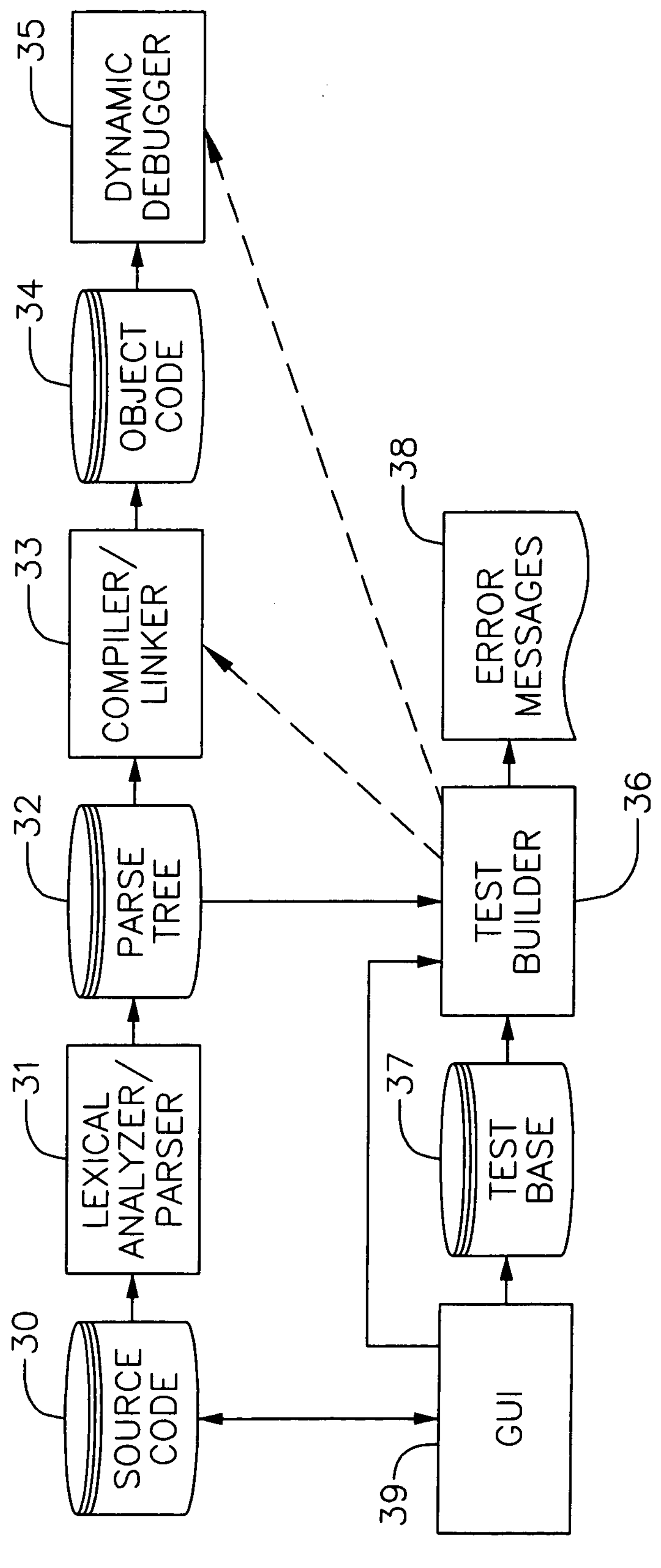

SOURCE CODE
30
LEXICAL ANALYZER/ PARSER
31
PARSE TREE
32
COMPILER/ LINKER
33
OBJECT CODE
34
DYNAMIC DEBUGGER
35
GUI
39
TEST BASE
37
TEST BUILDER
36
ERROR MESSAGES
38

FIG. 4

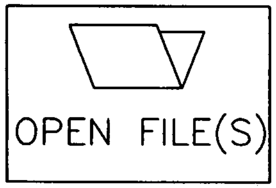
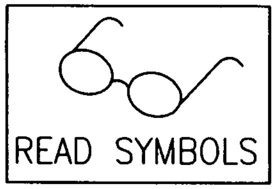
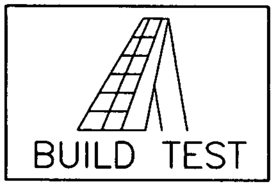
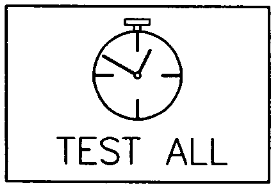
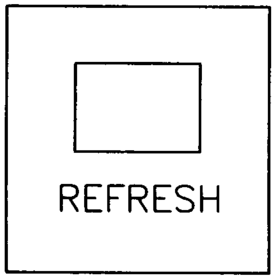
BUTTON	NAME	ACTION
	OPEN FILE(S)	OPENS A FILE CHOOSER FROM WHICH YOU CAN SELECT ONE OR MORE FILES. OPENED FILES WILL BE DISPLAYED IN THE FILE LIST.
	READ SYMBOLS	PARSES THE SELECTED FILE AND REPRESENTS ITS SYMBOLS IN THE SYMBOL TREE.
	BUILD TEST	PARSES THE CURRENT FILE, READS ITS SYMBOLS, INSTRUMENTS IT IF NECESSARY, THEN COMPILES AND LINKS IT.
	TEST ALL	BUILDS AND TESTS ALL FILES CURRENTLY IN THE FILE LIST.
	REFRESH	RECREATES YOUR SYMBOL TREE FROM ITS CURRENT SYMBOL REPOSITORY, CLOSES ALL EXPANDED NODES, AND DESELECTS THE CURRENTLY SELECTED NODE. IF THE FILE IS CLOSED, IT WILL CLEAR THE SYMBOL TREE AND OTHER TABS.

FIG.5

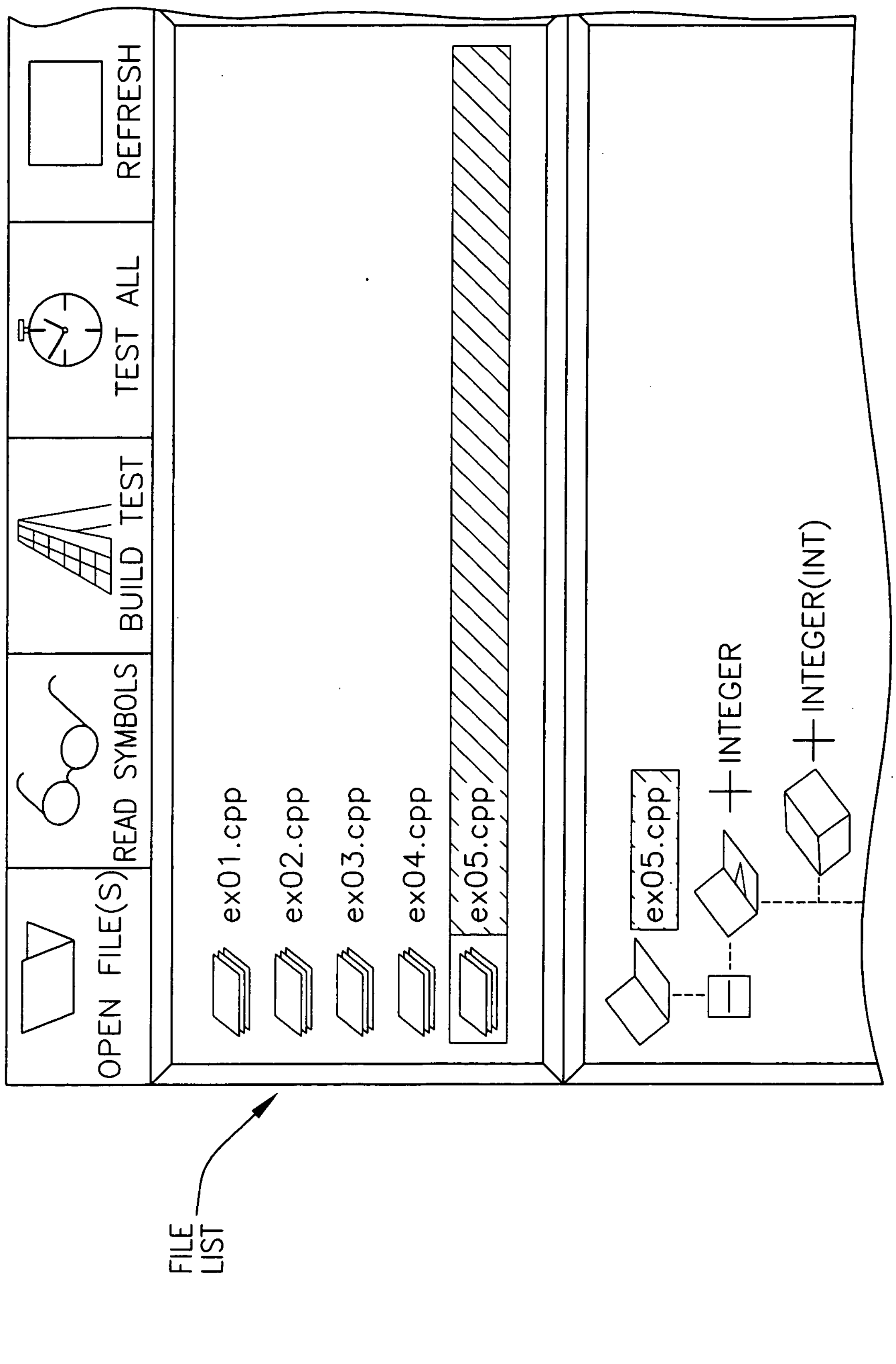

OPEN FILE(S)
READ SYMBOLS
BUILD TEST
TEST ALL
REFRESH
ex01.cpp
ex02.cpp
ex03.cpp
ex04.cpp
ex05.cpp
ex05.cpp
INTEGER
INTEGER(INT)
FILE LIST

FIG.6

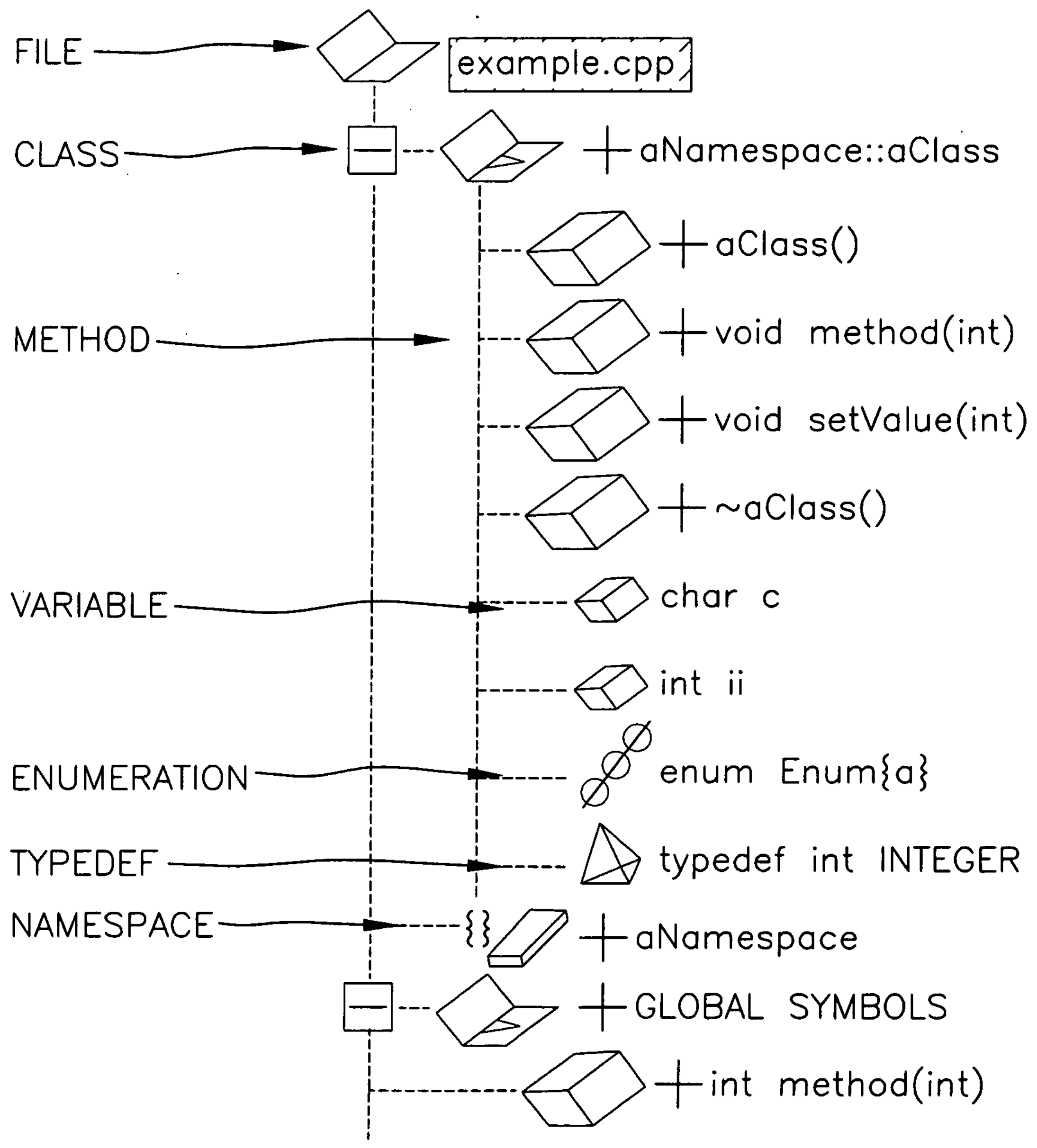
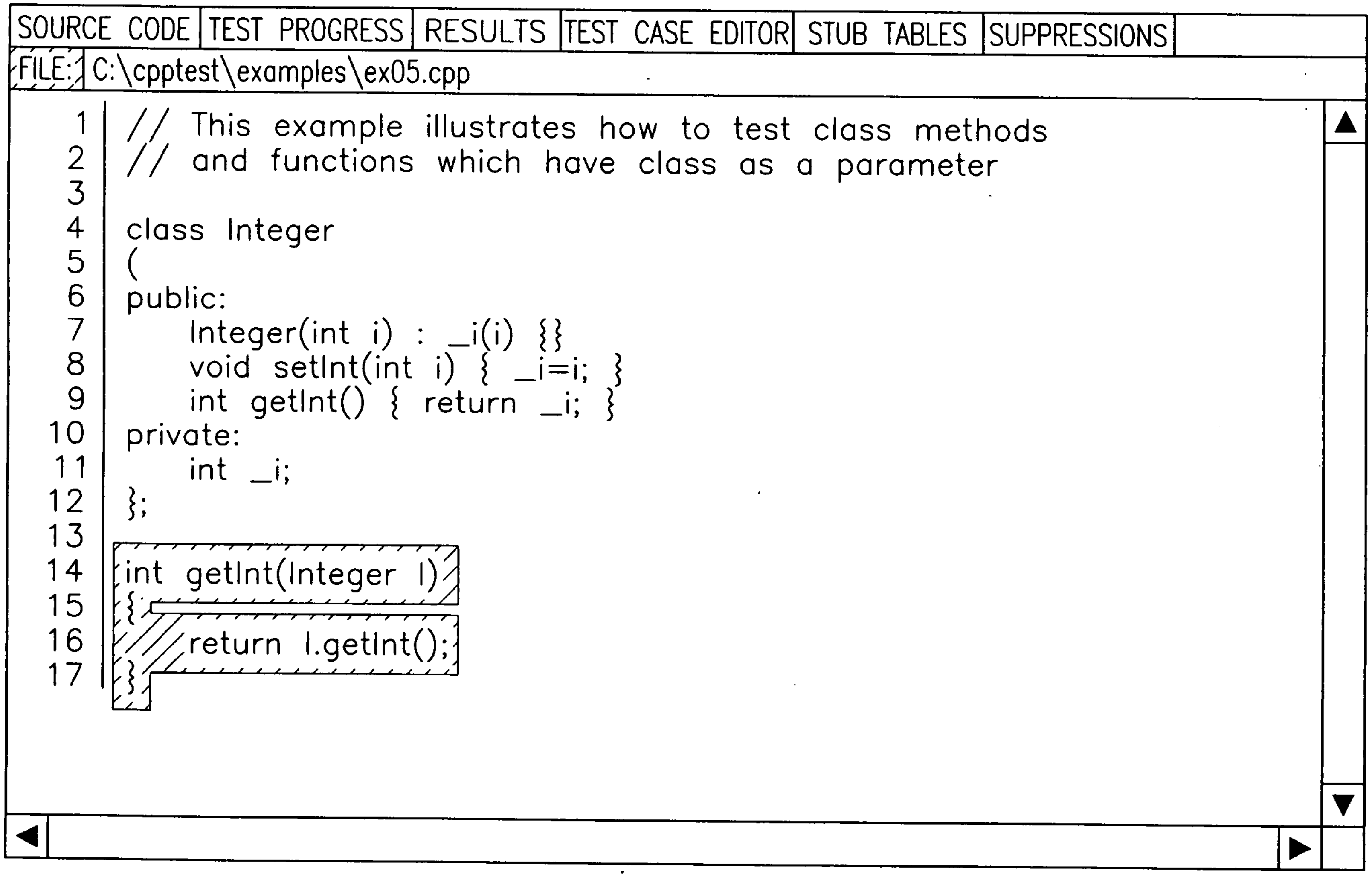

FILE
example.cpp
CLASS
aNamespace::aClass
aClass()
METHOD
void method(int)
void setValue(int)
~aClass()
VARIABLE
char c
int ii
ENUMERATION
enum Enum{a}
TYPEDEF
typedef int INTEGER
NAMESPACE
aNamespace
GLOBAL SYMBOLS
int method(int)

FIG. 7A



C:\cpptest\examples\ex05.cpp

```
// This example illustrates how to test class methods
// and functions which have class as a parameter

class Integer
(
public:
    Integer(int i) : _i(i) {}
    void setInt(int i) { _i=i; }
    int getInt() { return _i; }
private:
    int _i;
};

int getInt(Integer I)
{
    return I.getInt();
}
```

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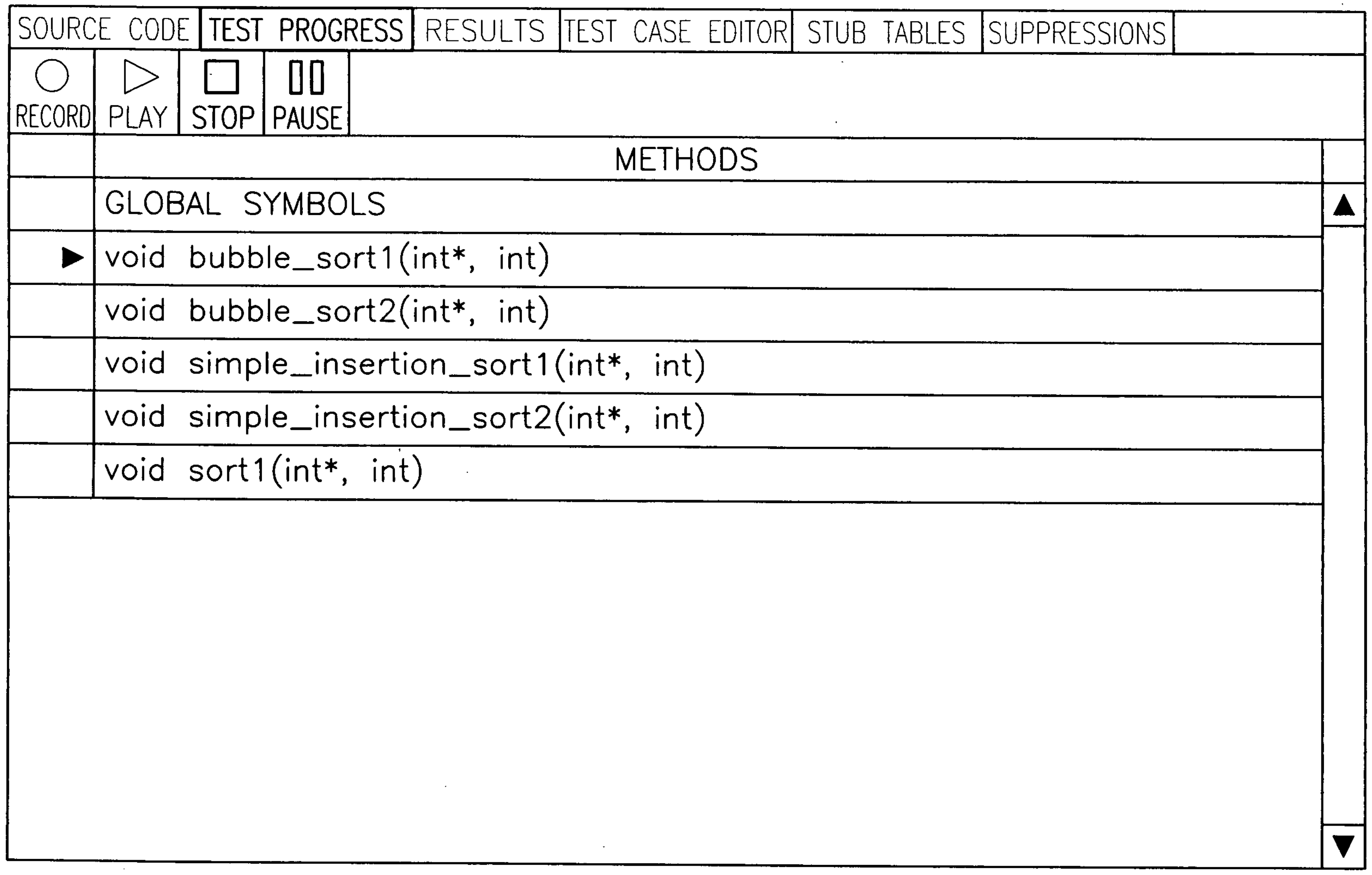
FIG. 7B



METHODS

GLOBAL SYMBOLS

▶ void bubble_sort1(int*, int)

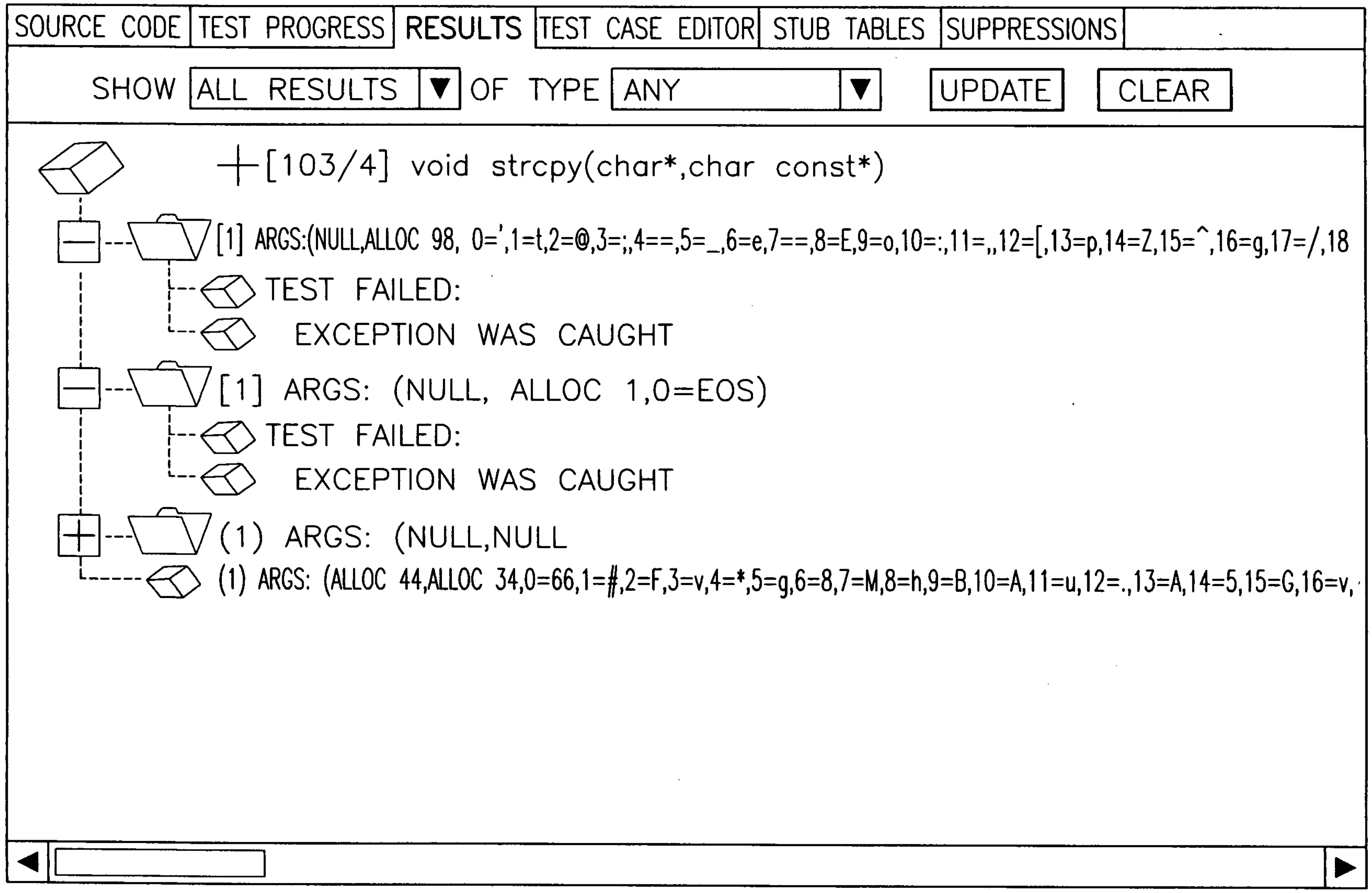
void bubble_sort2(int*, int)

void simple_insertion_sort1(int*, int)

void simple_insertion_sort2(int*, int)

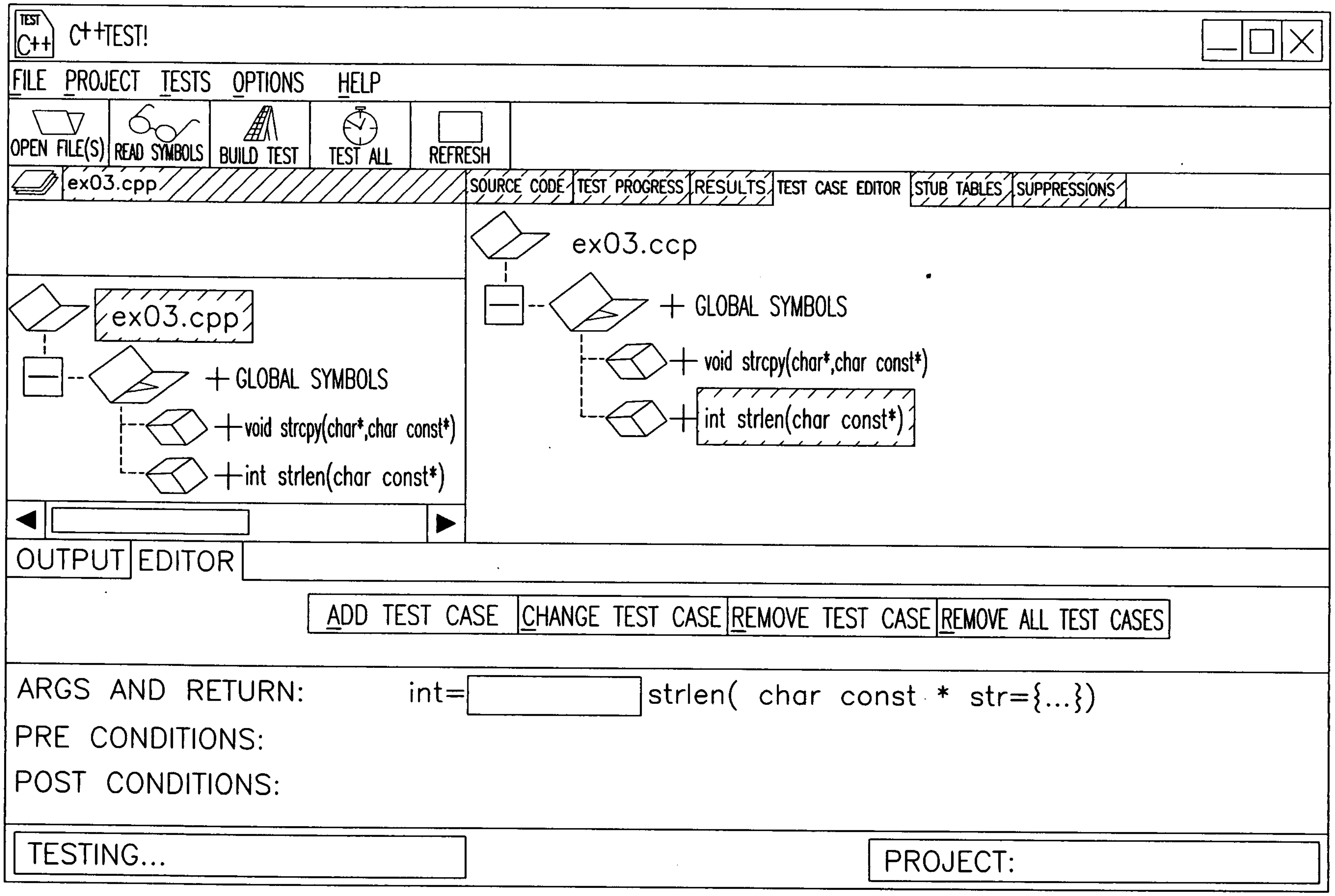
void sort1(int*, int)

FIG. 7C



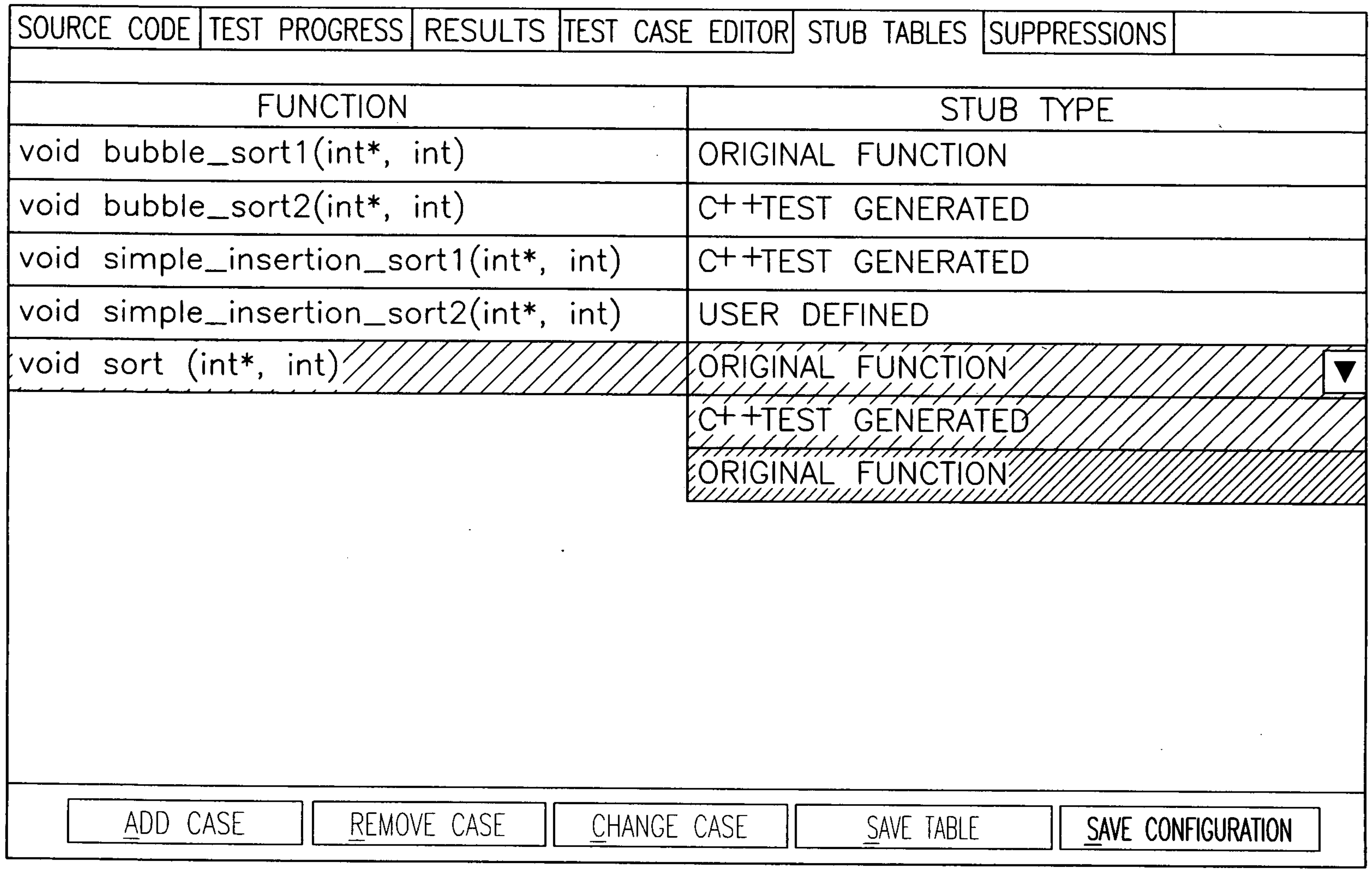
```
+[103/4] void strcpy(char*,char const*)
[1] ARGS:(NULL,ALLOC 98, 0=',1=t,2=@,3=;,4==,5=_,6=e,7==,8=E,9=o,10=:,11=,,12=[,13=p,14=Z,15=^,16=g,17=/,18
    TEST FAILED:
      EXCEPTION WAS CAUGHT
[1] ARGS: (NULL, ALLOC 1,0=EOS)
    TEST FAILED:
      EXCEPTION WAS CAUGHT
(1) ARGS: (NULL,NULL
(1) ARGS: (ALLOC 44,ALLOC 34,0=66,1=#,2=F,3=v,4=*,5=g,6=8,7=M,8=h,9=B,10=A,11=u,12=.,13=A,14=5,15=G,16=v,
```

FIG. 7D



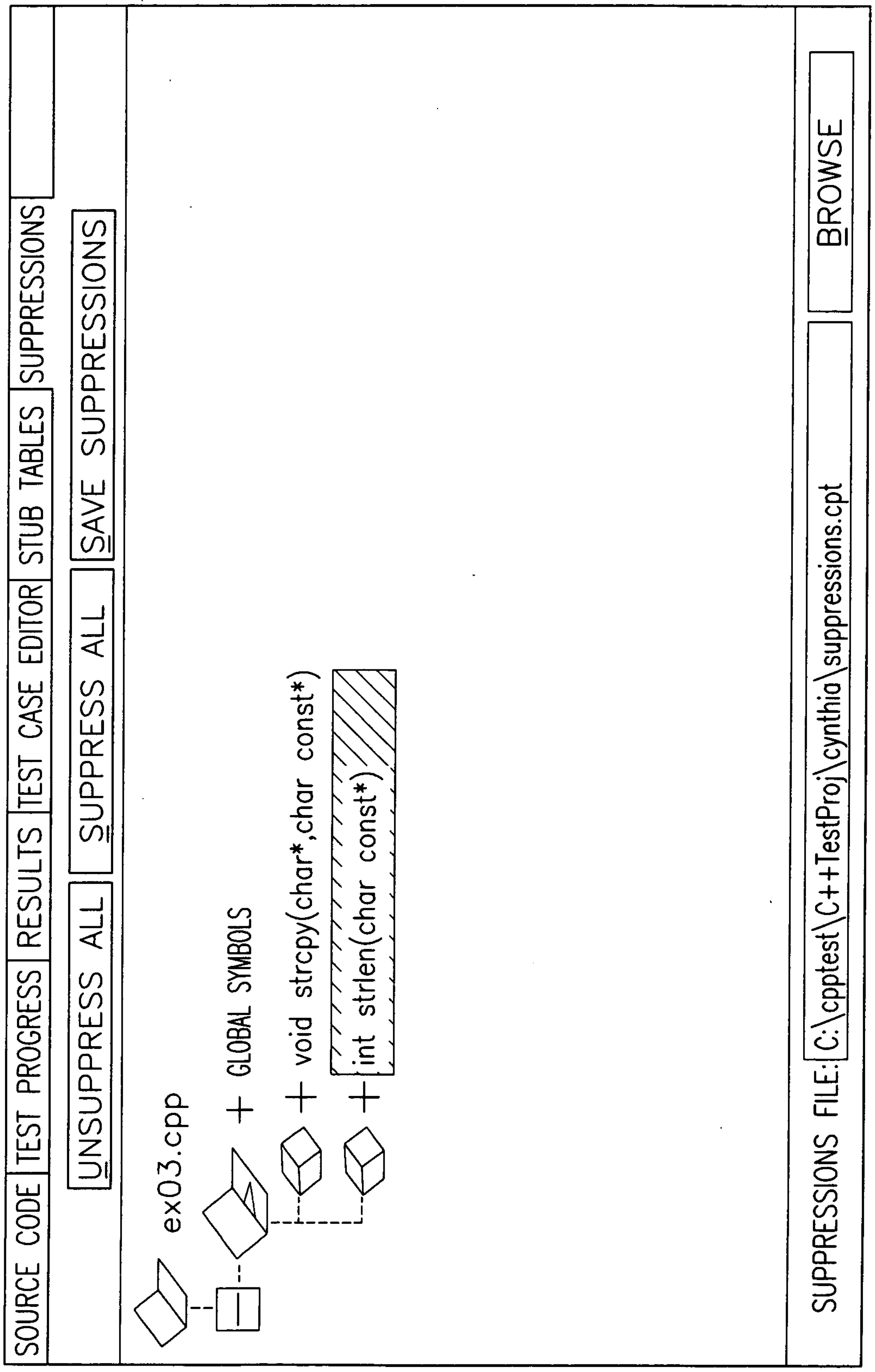
ARGS AND RETURN: int= strlen(char const * str={...})
PRE CONDITIONS:
POST CONDITIONS:

FIG. 7E



FUNCTION	STUB TYPE
void bubble_sort1(int*, int)	ORIGINAL FUNCTION
void bubble_sort2(int*, int)	C++TEST GENERATED
void simple_insertion_sort1(int*, int)	C++TEST GENERATED
void simple_insertion_sort2(int*, int)	USER DEFINED
void sort (int*, int)	ORIGINAL FUNCTION ▼
	C++TEST GENERATED
	ORIGINAL FUNCTION

FIG. 7F



ex03.cpp
+ GLOBAL SYMBOLS
+ void strcpy(char*,char const*)
+ int strlen(char const*)

SUPPRESSIONS FILE: C:\cpptest\C++TestProj\cynthia\suppressions.cpt

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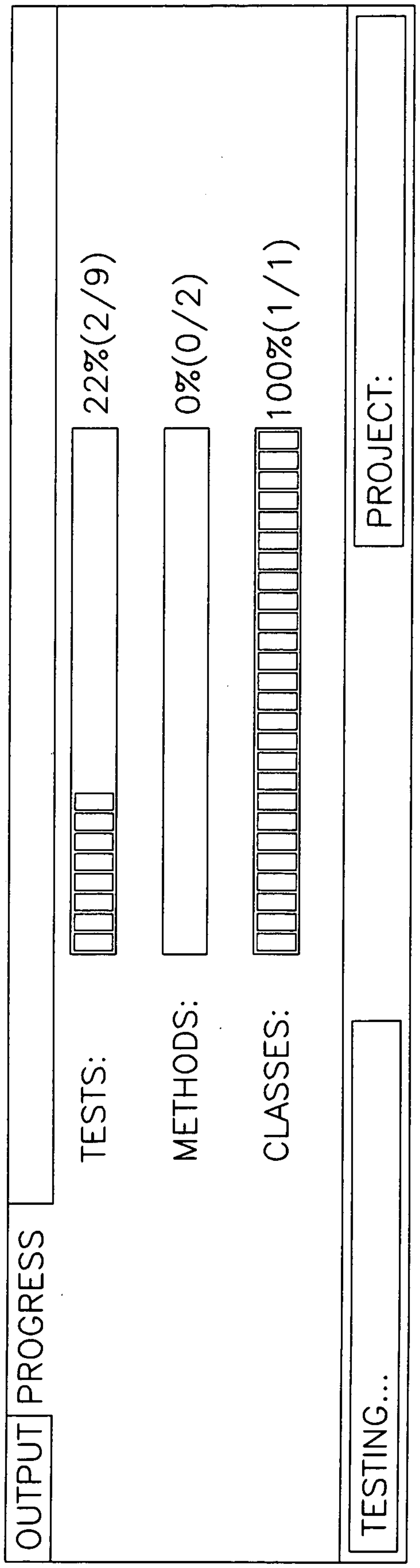
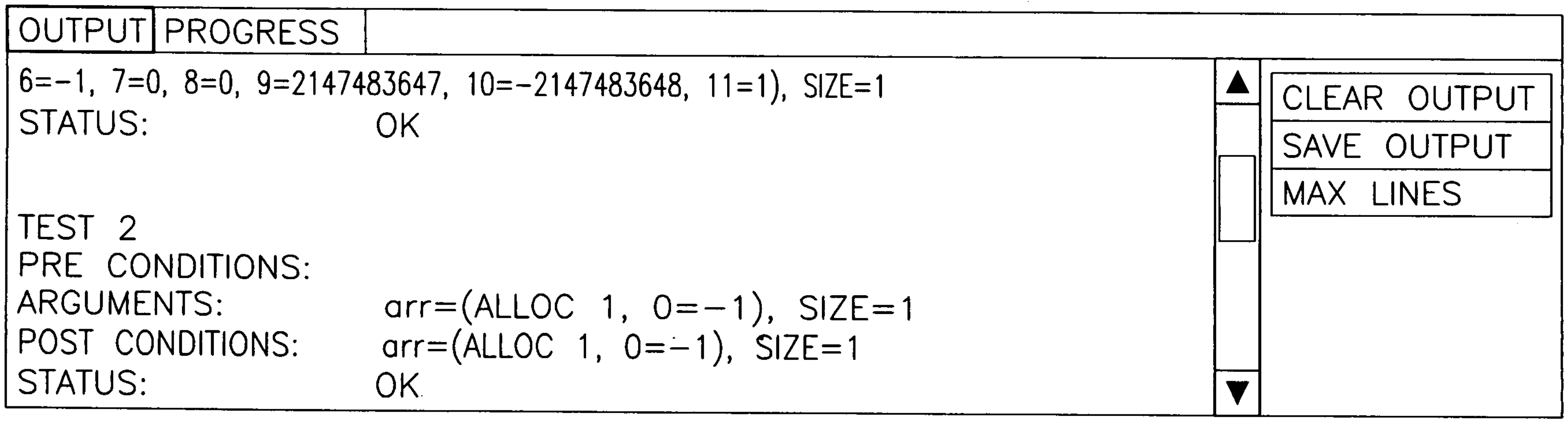
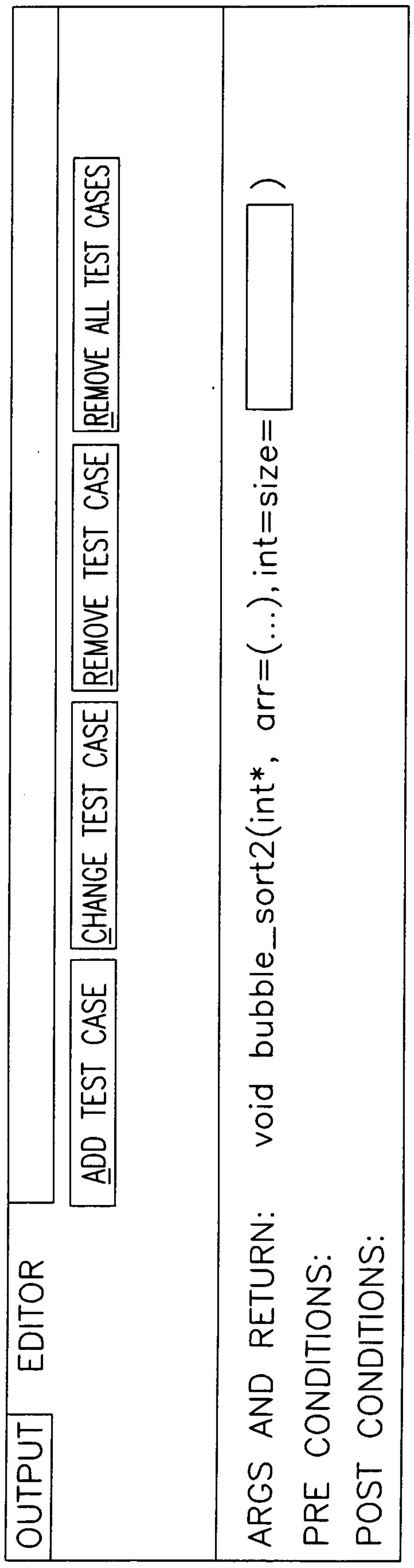


FIG. 7G

FIG. 7H



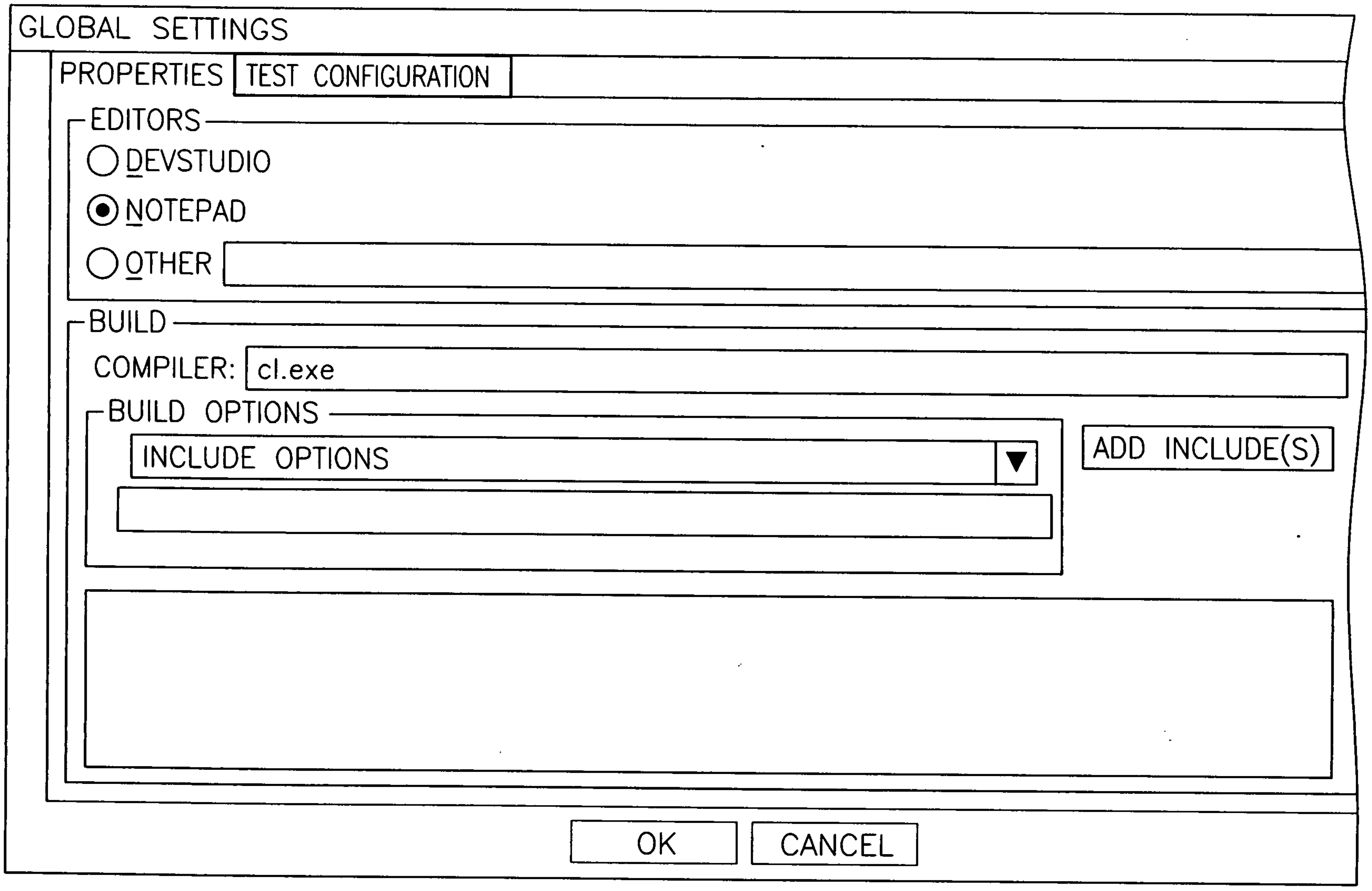
```
6=-1, 7=0, 8=0, 9=2147483647, 10=-2147483648, 11=1), SIZE=1
STATUS:                OK


TEST 2
PRE CONDITIONS:
ARGUMENTS:             arr=(ALLOC 1, 0=-1), SIZE=1
POST CONDITIONS:       arr=(ALLOC 1, 0=-1), SIZE=1
STATUS:                OK
```



ARGS AND RETURN: void bubble_sort2(int*, arr=(...), int=size=)
PRE CONDITIONS:
POST CONDITIONS:

FIG.7I

FIG. 7J


GLOBAL SETTINGS

PROPERTIES | TEST CONFIGURATION

EDITORS
- ○ DEVSTUDIO
- ● NOTEPAD
- ○ OTHER

BUILD

COMPILER: cl.exe

BUILD OPTIONS

FIG. 8

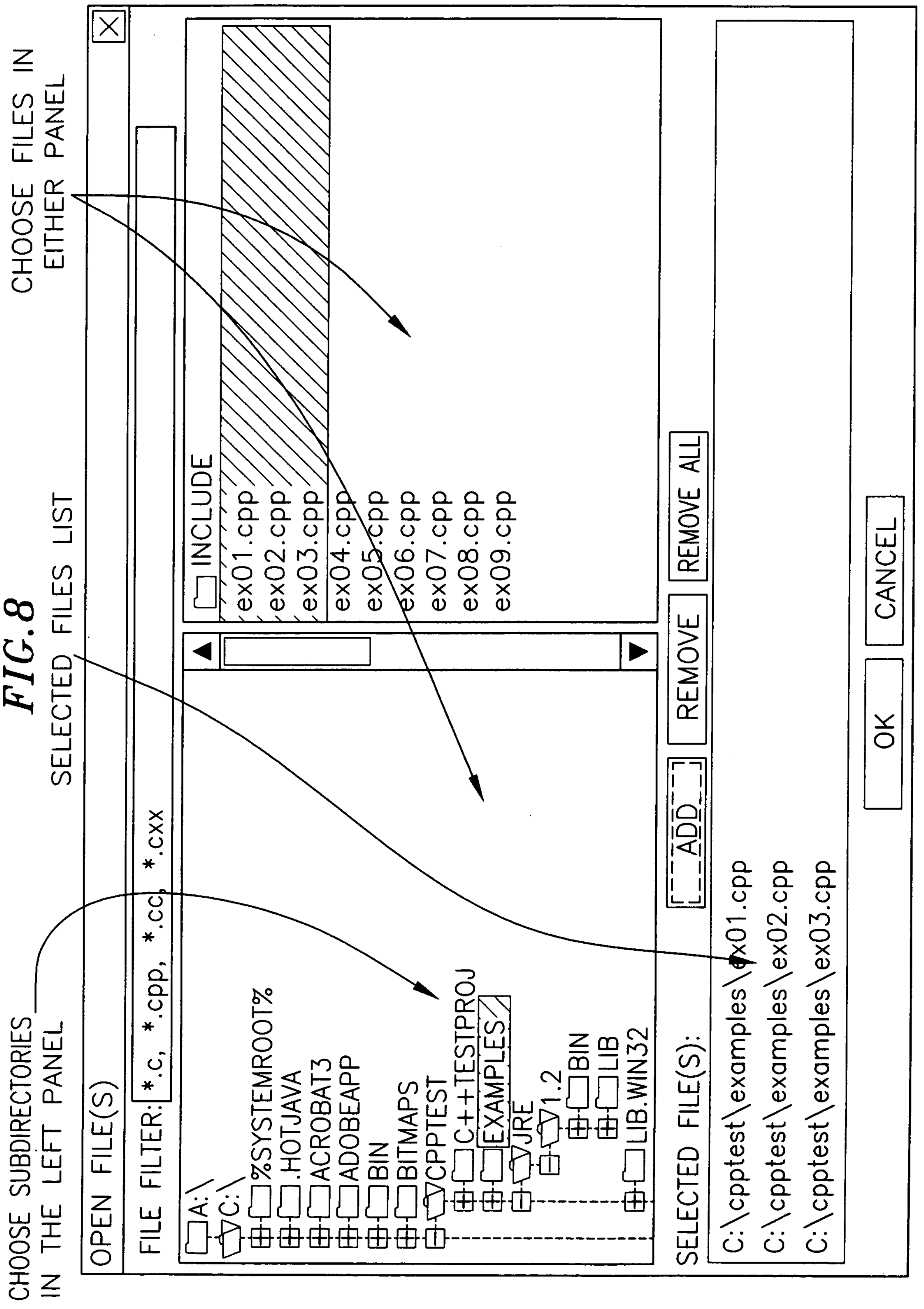
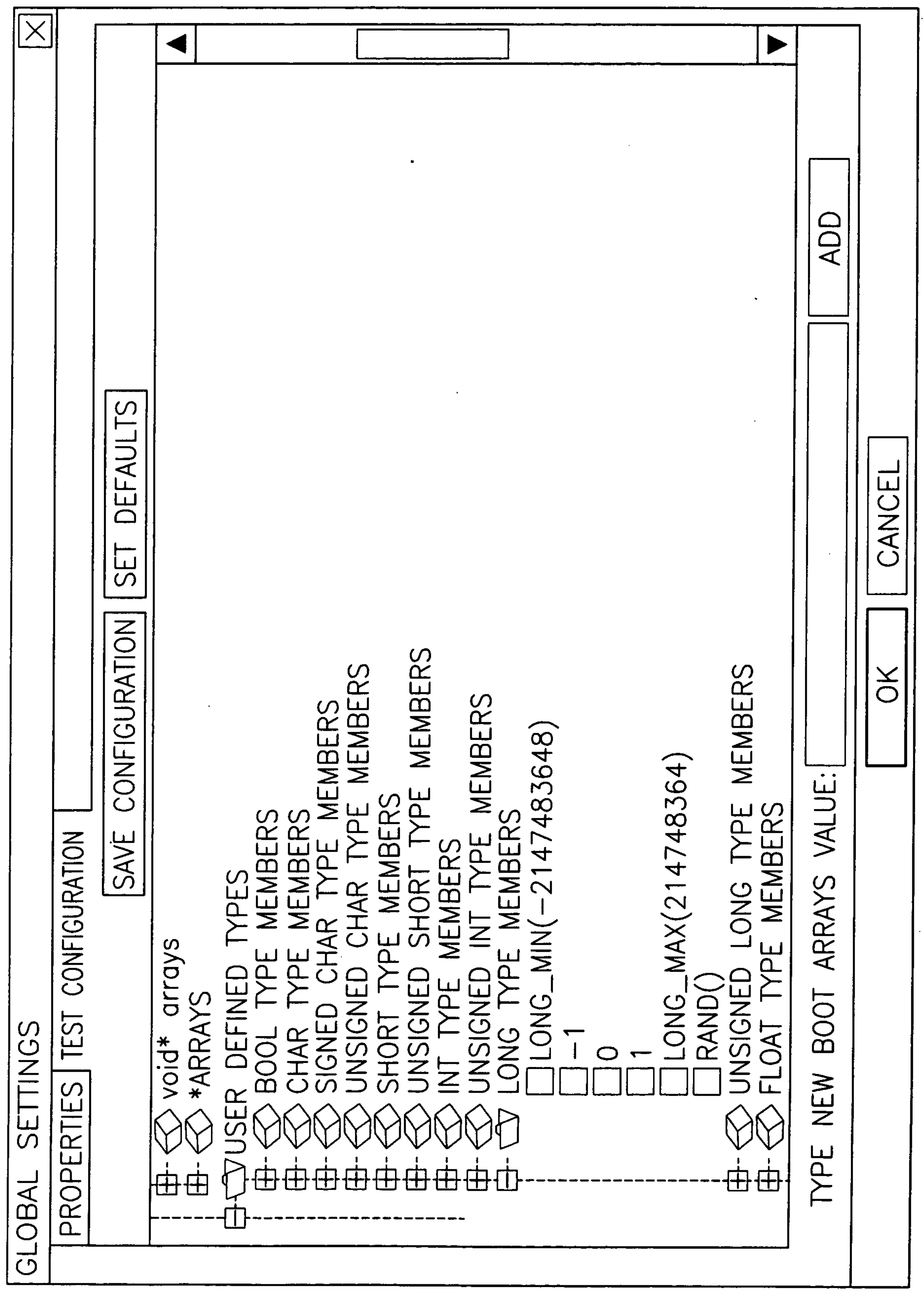

CHOOSE SUBDIRECTORIES IN THE LEFT PANEL
SELECTED FILES LIST
CHOOSE FILES IN EITHER PANEL
OPEN FILE(S)
FILE FILTER: *.c, *.cpp, *.cc, *.cxx
A:\
C:\
%SYSTEMROOT%
.HOTJAVA
ACROBAT3
ADOBEAPP
BIN
BITMAPS
CPPTEST
C++TESTPROJ
EXAMPLES
JRE
1.2
BIN
LIB
LIB.WIN32
INCLUDE
ex01.cpp
ex02.cpp
ex03.cpp
ex04.cpp
ex05.cpp
ex06.cpp
ex07.cpp
ex08.cpp
ex09.cpp
ADD
REMOVE
REMOVE ALL
SELECTED FILE(S):
C:\cpptest\examples\ex01.cpp
C:\cpptest\examples\ex02.cpp
C:\cpptest\examples\ex03.cpp
OK
CANCEL

FIG.9


GLOBAL SETTINGS

PROPERTIES | TEST CONFIGURATION

SAVE CONFIGURATION | SET DEFAULTS

```
⊞ void* arrays
⊞ *ARRAYS
⊟ USER DEFINED TYPES
  ⊞ BOOL TYPE MEMBERS
  ⊞ CHAR TYPE MEMBERS
  ⊞ SIGNED CHAR TYPE MEMBERS
  ⊞ UNSIGNED CHAR TYPE MEMBERS
  ⊞ SHORT TYPE MEMBERS
  ⊞ UNSIGNED SHORT TYPE MEMBERS
  ⊞ INT TYPE MEMBERS
  ⊞ UNSIGNED INT TYPE MEMBERS
  ⊟ LONG TYPE MEMBERS
      ☐ LONG_MIN(−2147483648)
      ☐ −1
      ☐ 0
      ☐ 1
      ☐ LONG_MAX(214748364)
      ☐ RAND()
  ⊞ UNSIGNED LONG TYPE MEMBERS
  ⊞ FLOAT TYPE MEMBERS
```

TYPE NEW BOOT ARRAYS VALUE: | ADD

OK | CANCEL

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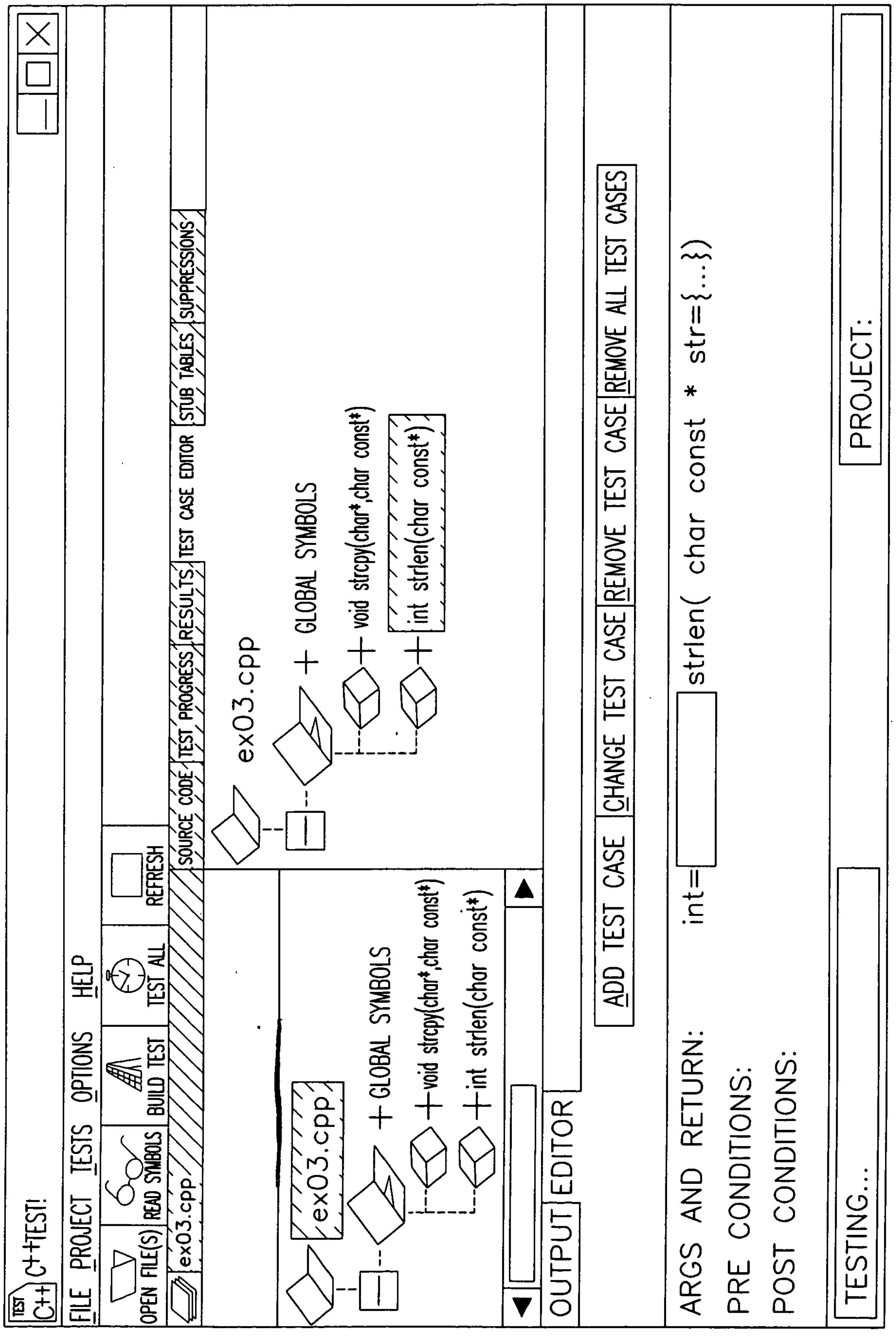
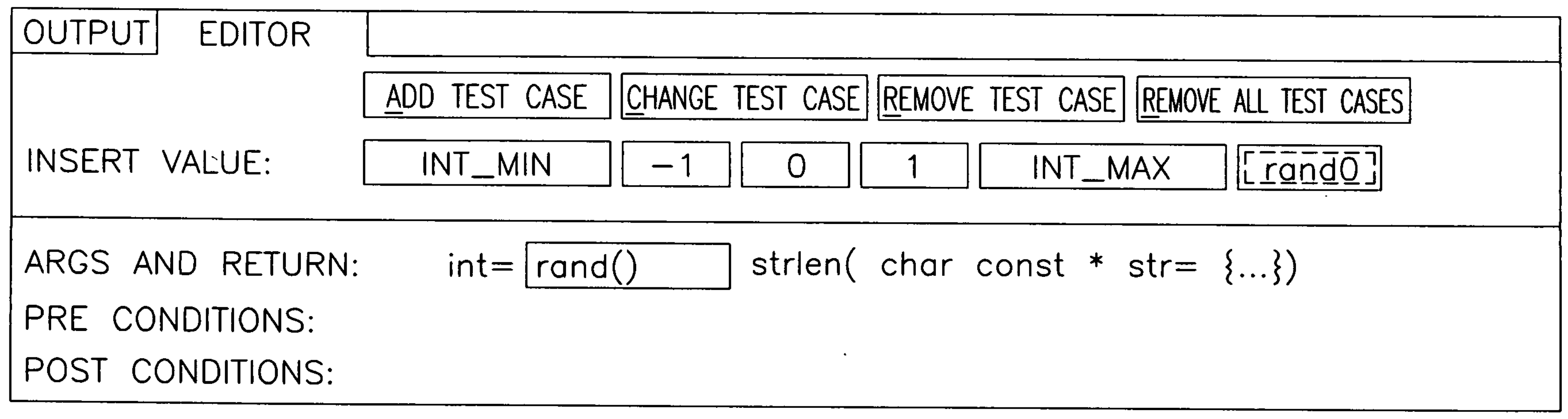
FIG. 10A



ARGS AND RETURN: int= strlen(char const * str={...})

FIG. 10B


OUTPUT
EDITOR
ADD TEST CASE
CHANGE TEST CASE
REMOVE TEST CASE
REMOVE ALL TEST CASES
INSERT VALUE:
INT_MIN
–1
0
1
INT_MAX
rand()
ARGS AND RETURN:
int= rand() strlen(char const * str= {...})
PRE CONDITIONS:
POST CONDITIONS:

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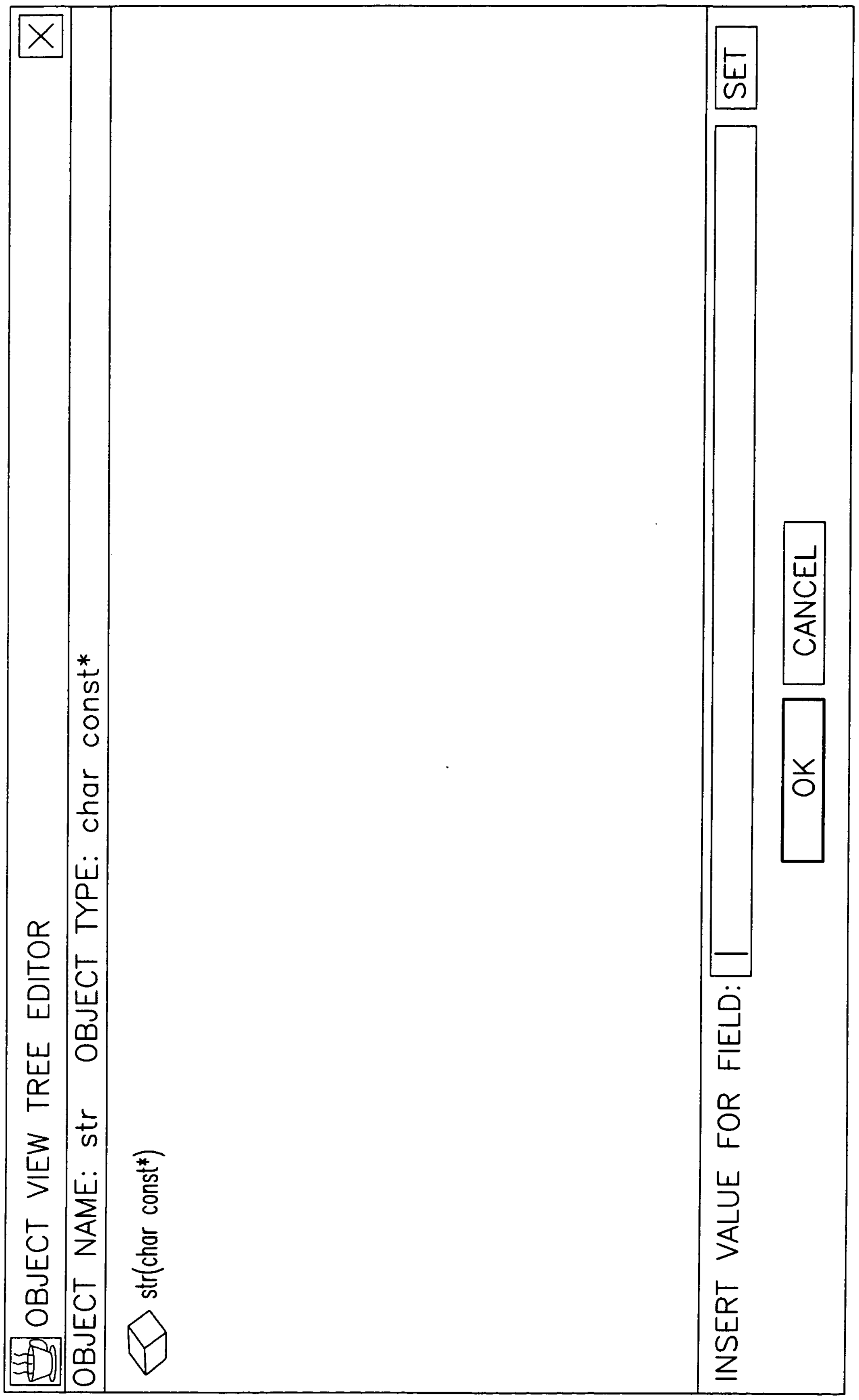

OBJECT VIEW TREE EDITOR

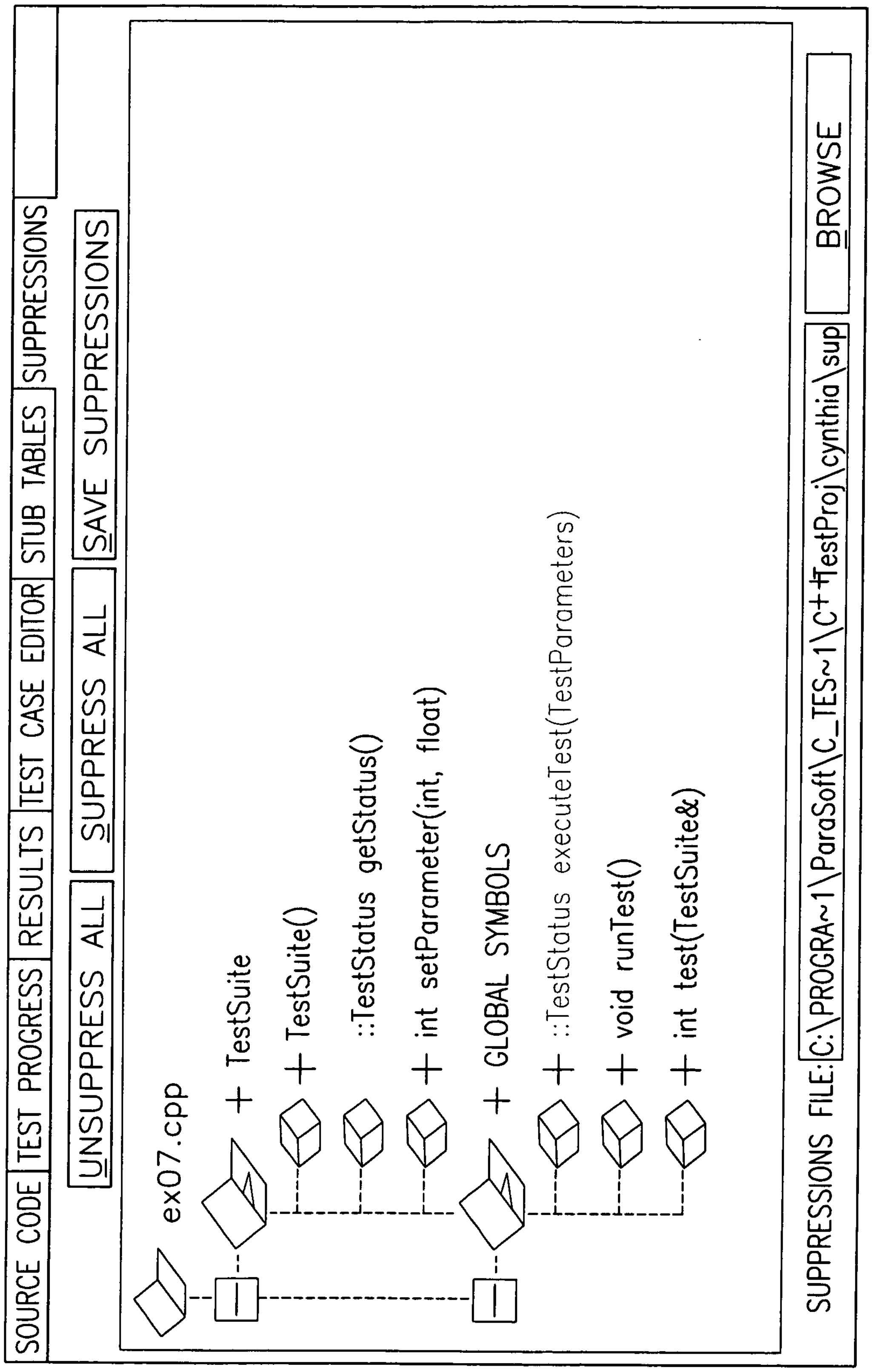
OBJECT NAME: str OBJECT TYPE: char const*

str(char const*)

INSERT VALUE FOR FIELD:

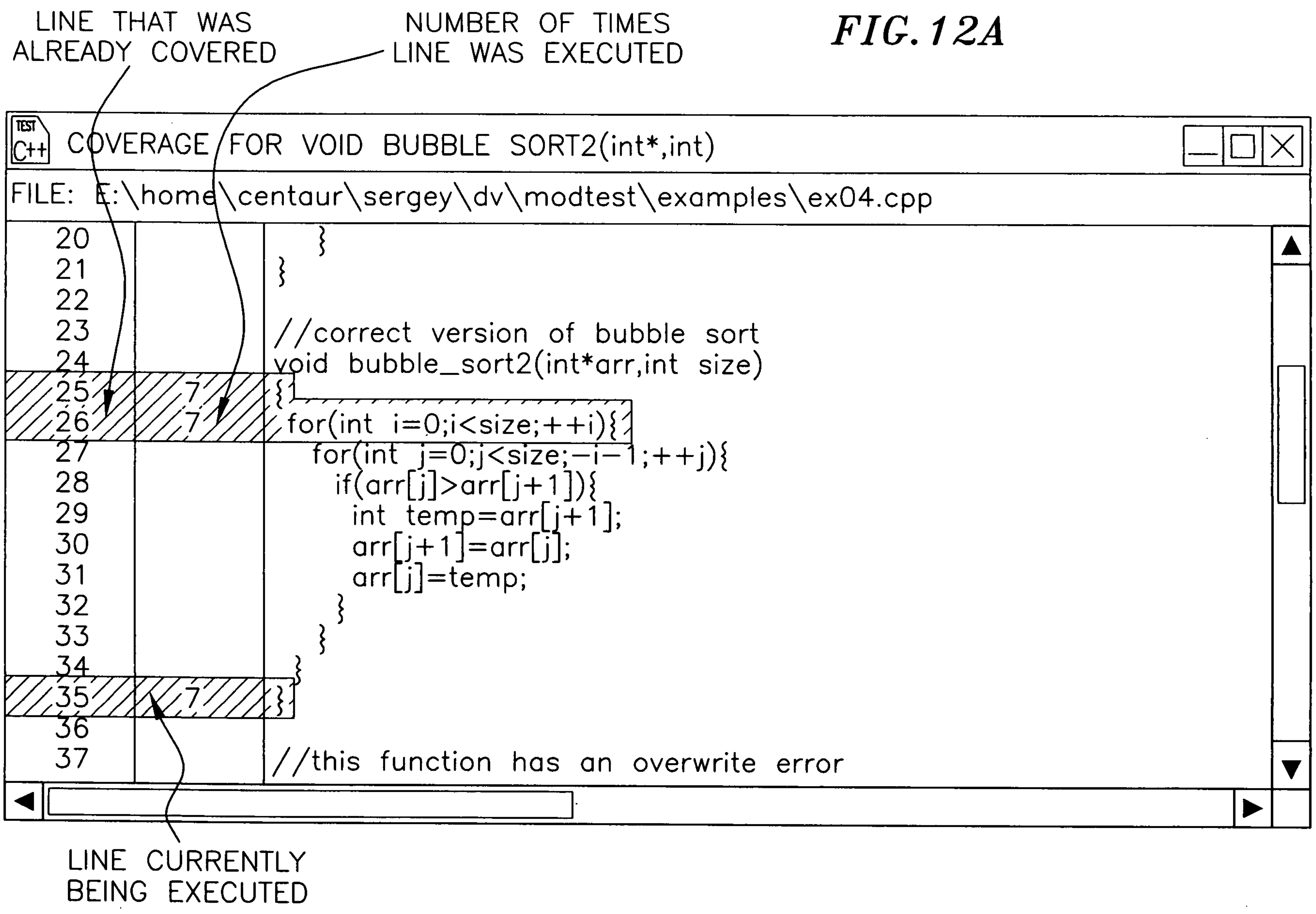
FIG. 10C

FIG. 11



SUPPRESSIONS FILE: C:\PROGRA~1\ParaSoft\C_TES~1\C++TestProj\cynthia\sup

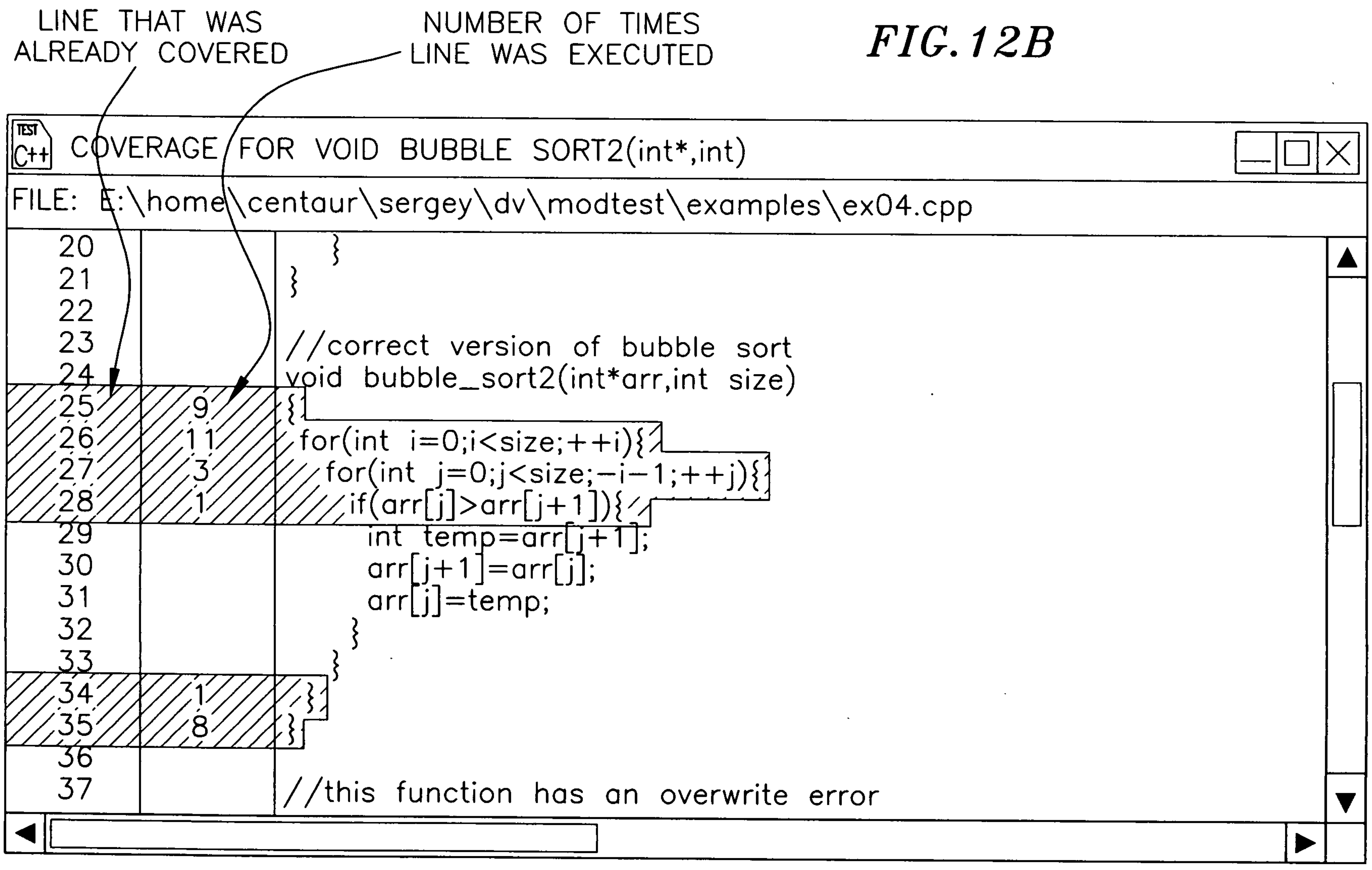
FIG. 12A


LINE THAT WAS ALREADY COVERED
NUMBER OF TIMES LINE WAS EXECUTED
LINE CURRENTLY BEING EXECUTED

COVERAGE FOR VOID BUBBLE SORT2(int*,int)

FILE: E:\home\centaur\sergey\dv\modtest\examples\ex04.cpp

```
20              }
21          }
22
23          //correct version of bubble sort
24          void bubble_sort2(int*arr,int size)
25     7    {
26     7     for(int i=0;i<size;++i){
27             for(int j=0;j<size;-i-1;++j){
28               if(arr[j]>arr[j+1]){
29                 int temp=arr[j+1];
30                 arr[j+1]=arr[j];
31                 arr[j]=temp;
32               }
33             }
34           }
35     7    }
36
37          //this function has an overwrite error
```


LINE THAT WAS ALREADY COVERED
NUMBER OF TIMES LINE WAS EXECUTED

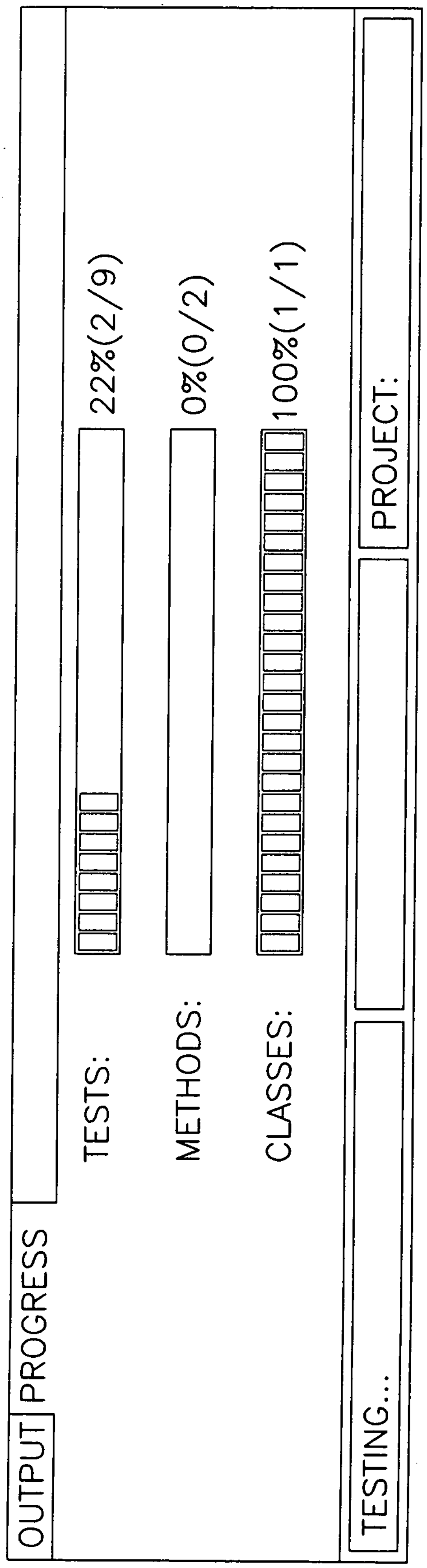
COVERAGE FOR VOID BUBBLE SORT2(int*,int)

FILE: E:\home\centaur\sergey\dv\modtest\examples\ex04.cpp

```
20                }
21            }
22
23            //correct version of bubble sort
24            void bubble_sort2(int*arr,int size)
25     9      {
26    11       for(int i=0;i<size;++i){
27     3         for(int j=0;j<size;-i-1;++j){
28     1           if(arr[j]>arr[j+1]){
29                   int temp=arr[j+1];
30                   arr[j+1]=arr[j];
31                   arr[j]=temp;
32                 }
33               }
34     1       }
35     8      }
36
37            //this function has an overwrite error
```

FIG. 12B

FIG. 13



TESTS: 22%(2/9)
METHODS: 0%(0/2)
CLASSES: 100%(1/1)

TESTING...
PROJECT:

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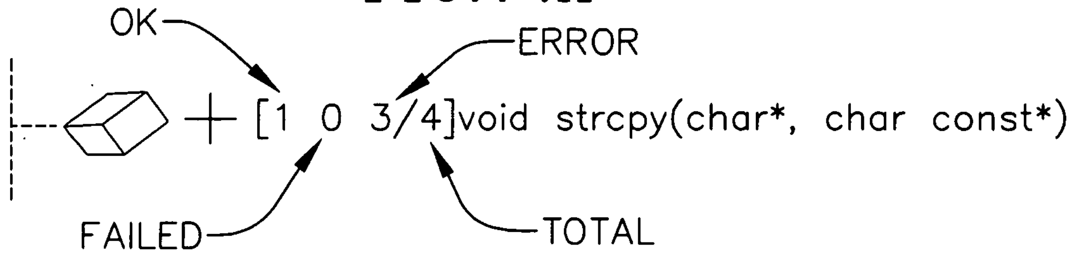
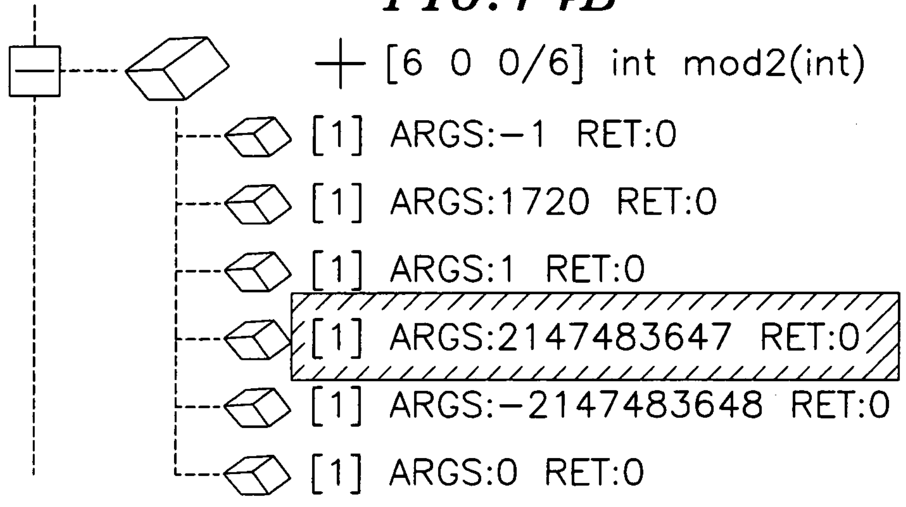
FIG. 14A



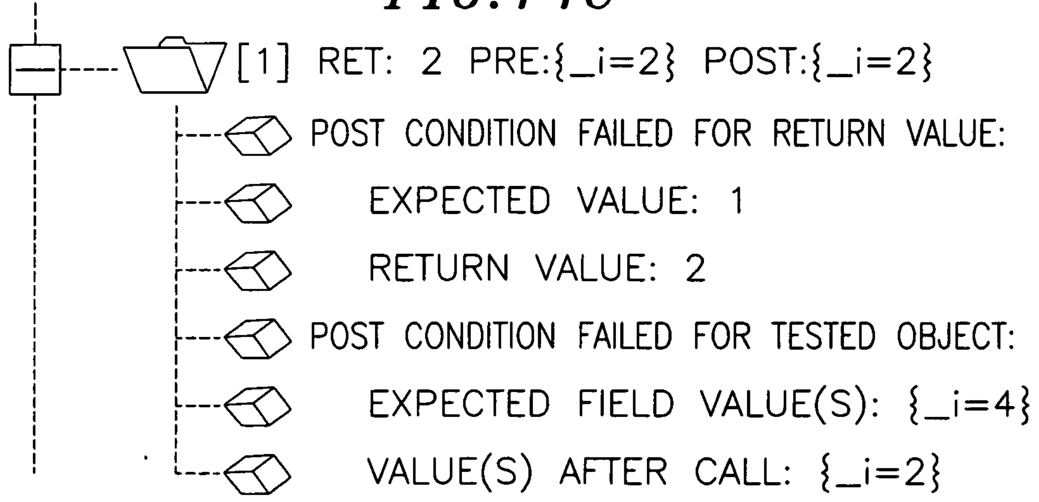
```
[1 0 3/4]void strcpy(char*, char const*)
```

FIG. 14B



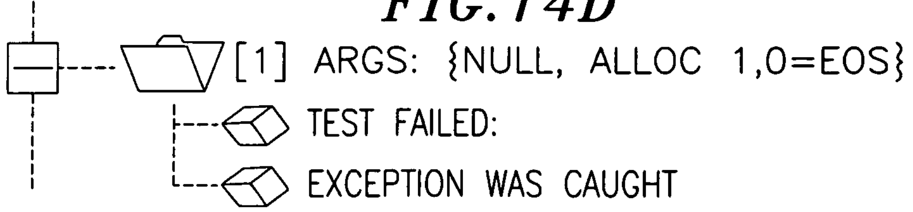
```
[6 0 0/6] int mod2(int)
    [1] ARGS:-1 RET:0
    [1] ARGS:1720 RET:0
    [1] ARGS:1 RET:0
    [1] ARGS:2147483647 RET:0
    [1] ARGS:-2147483648 RET:0
    [1] ARGS:0 RET:0
```

FIG. 14C



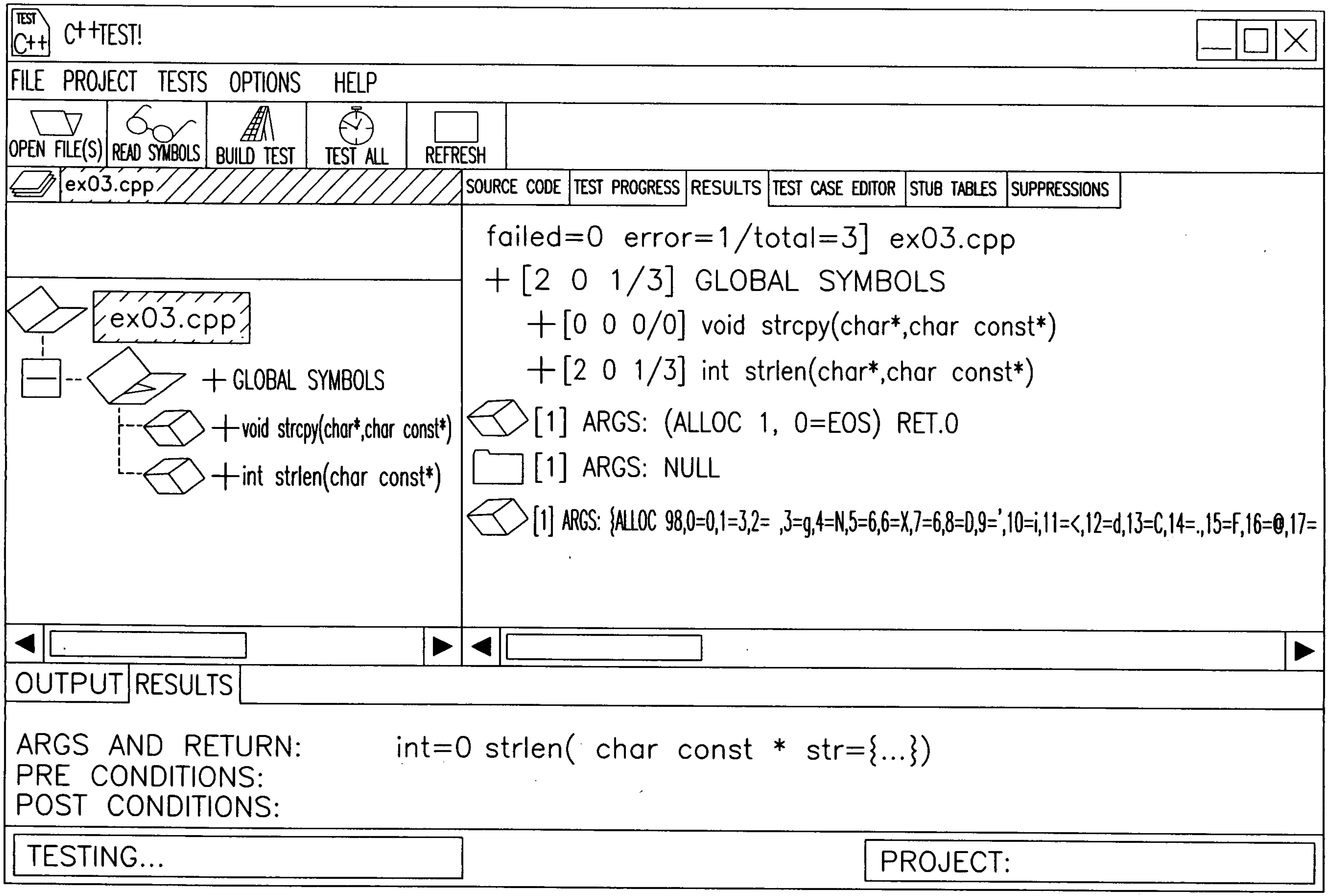
```
[1] RET: 2 PRE:{_i=2} POST:{_i=2}
    POST CONDITION FAILED FOR RETURN VALUE:
        EXPECTED VALUE: 1
        RETURN VALUE: 2
    POST CONDITION FAILED FOR TESTED OBJECT:
        EXPECTED FIELD VALUE(S): {_i=4}
        VALUE(S) AFTER CALL: {_i=2}
```

FIG. 14D



```
[1] ARGS: {NULL, ALLOC 1,0=EOS}
    TEST FAILED:
    EXCEPTION WAS CAUGHT
```

FIG. 14E



```
failed=0  error=1/total=3]  ex03.cpp
+[2  0  1/3]  GLOBAL  SYMBOLS
   +[0  0  0/0]  void  strcpy(char*,char  const*)
   +[2  0  1/3]  int  strlen(char*,char  const*)
[1]  ARGS:  (ALLOC  1,  0=EOS)  RET.0
[1]  ARGS:  NULL
[1] ARGS: {ALLOC 98,0=0,1=3,2= ,3=g,4=N,5=6,6=X,7=6,8=D,9=',10=i,11=<,12=d,13=C,14=.,15=F,16=@,17=
```

```
ARGS  AND  RETURN:       int=0 strlen( char  const  *  str={...})
PRE  CONDITIONS:
POST  CONDITIONS:
```